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# Inflation Since the Pandemic: Lessons and Challenges

Ina Hajdini
Federal Reserve Bank of Cleveland

Adam Shapiro
Federal Reserve Bank of San Francisco

A. Lee Smith
Federal Reserve Bank of Kansas City

Daniel Villar
Board of Governors of the Federal Reserve System

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# Inflation Since the Pandemic: Lessons and Challenges

Ina Hajdini, Adam Shapiro, A. Lee Smith, Daniel Villar

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*The analysis in this paper was presented to the Federal Open Market Committee as background for its discussion of the Federal Reserve's 2025 review of its monetary policy strategy, tools, and communications.*

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**Abstract:** This paper reviews the drivers of the post-pandemic U.S. inflation surge and subsequent decline, including the behavior and role of inflation expectations. The sharp rise in inflation reflected severe imbalances between supply and demand stemming from the shocks of the pandemic and the policy response. Measures of short-term inflation expectations increased alongside realized inflation, especially those of households and firms, which may have contributed to inflation's persistence through price- and wage-setting behavior. However, measures of longer-term inflation expectations remained generally well anchored, which likely prevented a larger or more lasting increase in inflation. The stability of longer-term inflation expectations, together with easing supply and demand imbalances, allowed inflation to fall from its peak in mid-2022 without a large increase in unemployment. We conclude by reviewing some lessons learned from this episode as well as potential risks to inflation going forward.

**JEL Classification:** E31, E52, E58, E70.

**Keywords:** Inflation, inflation expectations, COVID-19, monetary policy.

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Note: Authors' affiliations are Federal Reserve Bank of Cleveland (Hajdini), Federal Reserve Bank of San Francisco (Shapiro), Federal Reserve Bank of Kansas City (Smith), and Board of Governors of the Federal Reserve System (Villar), respectively. The views expressed are those of the authors and do not necessarily reflect the views of anyone else affiliated with the Federal Reserve System. The authors thank Andrew Figura, Ed Knotek, Sylvain Leduc, Anna Paulson, Trevor Reeve, Sam Schulhofer-Wohl, and Stacey Tevlin for valuable feedback and suggestions. On earlier drafts, the authors also benefited from comments by Stephanie Aaronson, Glenn Follette, Kurt Lewis, Ekaterina Peneva, Jeremy Rudd, and William Wascher. The authors thank Lucas Moyon for excellent research assistance.

## 1. Introduction and overview

U.S. inflation surged in the aftermath of the pandemic after being subdued for more than two decades. This paper reviews the key drivers of U.S. inflation over this period as well as the behavior and role of inflation expectations and highlights some lessons learned that could be informative for understanding and monitoring inflation dynamics going forward. Our key takeaways are the following:

- High inflation reflected the interaction of large and persistent shifts in supply and demand across the U.S. economy. These shifts were driven by the pandemic itself, as well as stabilization efforts, including strong fiscal stimulus and accommodative monetary policy. The resulting imbalances were amplified by capacity constraints, which limited the ability of supply to increase—often referred to as a nonlinearity.
- Although the labor market eventually reached historically tight levels, supply and demand imbalances extended well beyond the labor market. Even accounting for nonlinearities, most Phillips curve estimates suggest that labor market tightness can explain only part of the rise in inflation in 2021 and 2022.
- Despite increases in shorter-term inflation expectations, monetary policy helped to keep longer-term inflation expectations generally well anchored. The stability of longer-term inflation expectations, in turn, likely helped to contain the inflation surge, allowing inflation and short-term inflation expectations to fall without a large increase in unemployment.
- The events driving the pandemic inflation surge were extreme, which warrants caution against drawing too many conclusions from this episode. Nevertheless, we think there are two lessons that can be carried forward: (1) that the inflation environment can change abruptly amid large shocks and (2) the importance of keeping longer-term inflation expectations well anchored.
- Looking ahead, inflation risks appear to be more balanced now than they appeared five years ago. We highlight three particular considerations: (1) a greater appreciation for supply factors and the importance of capacity constraints, (2) the potential for inflation expectations to be more responsive to price increases after a period of high inflation, and (3) a reassessment of effective lower bound (ELB) risk and the threat it poses to longer-term inflation expectations.

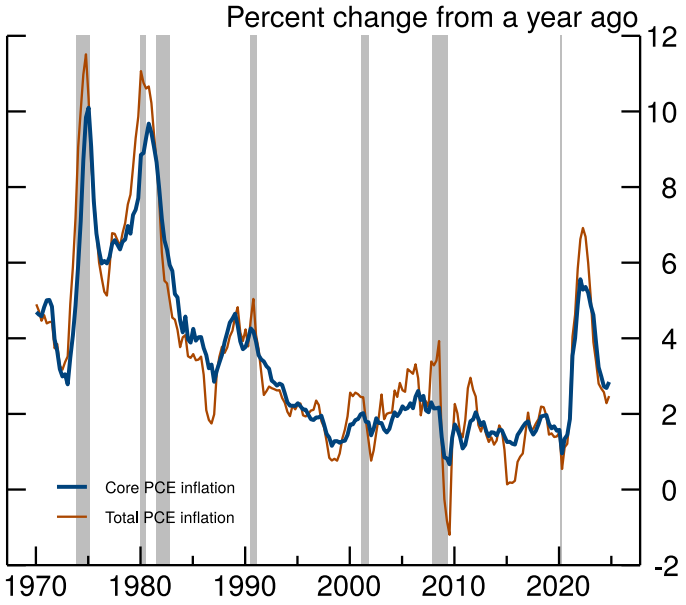
## 2. The inflation surge: The roles of supply, demand, and nonlinearities

In this section, we review the shocks resulting from the pandemic and subsequent policy responses that led to large shifts in supply and demand. We also examine the role played by supply constraints in amplifying the inflationary effects of these shifts—so-called nonlinearities in the aggregate supply curve. Finally, we discuss the easing of supply–demand imbalances beginning in 2022 that brought about the decline in inflation.

### 2.1 The post-2020 inflation surge—a stark break from pre-pandemic inflation

The U.S., along with economies across the globe, experienced a surge in inflation in the years following the onset of the COVID-19 pandemic.[1] Inflation, as measured by the 12-month change in the personal consumption expenditures (PCE) price index, reached 7.3 percent in the summer of 2022. As shown in figure 1, this spike represented a stark break from the decade before the pandemic, in which inflation was mostly low and increases in inflation were not persistent.

**Figure 1: Headline and core PCE inflation**




Source: Bureau of Economic Analysis; National Bureau of Economic Research.

This sharp rise in inflation reflected severe imbalances between supply and demand stemming from the large and persistent shocks unleashed by the pandemic and the policy response. The initial phase of the pandemic was centered around public health risks that prompted production shutdowns, disruptions in global supply chains, and a contraction in labor

[1] For a discussion of the international inflation experience, see Lipinska, Martinez Garcia, and Schwartzman (2025).

supply. Strong monetary and fiscal support came quickly, which kept household balance sheets strong and supported demand throughout 2020. By the spring of 2021, the unemployment rate had recovered significantly, and as shown in figure 2, total consumer spending had returned to its pre-pandemic trend.[2]

Consumer preferences, however, had shifted dramatically away from high-contact services toward goods. Although total consumer spending had recovered, services consumption was approximately 5 percent below its pre-pandemic trend, while goods consumption was approximately 10 percent above its trend. With pandemic-related supply constraints still binding, this change in consumer preferences strained the goods market.[3] This result was evidenced by exhausted inventories, long delivery times, and, as shown in figure 3, increasing goods price inflation.

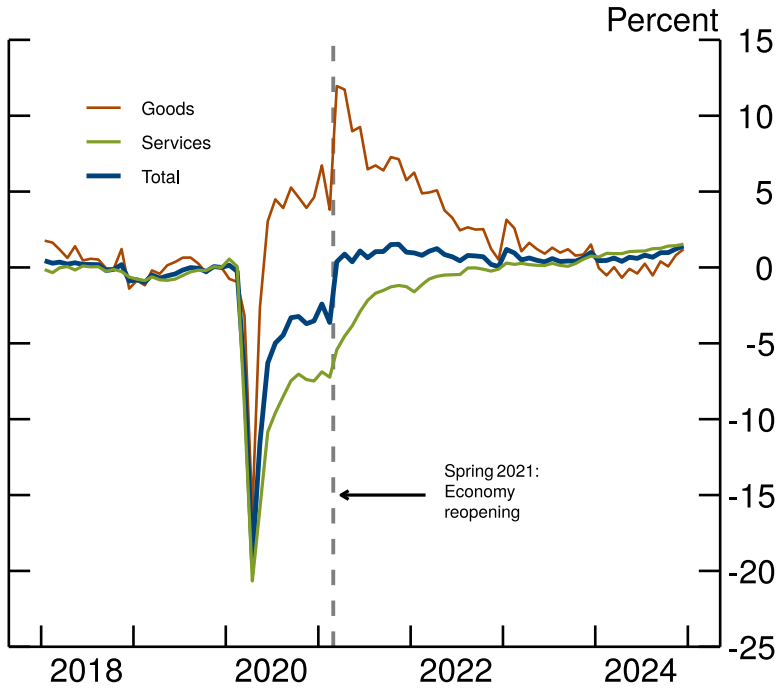
The relative demand for goods and services started normalizing after the economy began reopening in earnest in spring 2021. However, inflation pressures emerged in the services sector alongside a sluggish recovery in labor supply. Supply and demand imbalances in the labor market worsened throughout 2021, indicated by a surge in quits and job vacancies. Nominal wage growth steadily increased, keeping upward pressure on production costs as well as propping up nominal household incomes. As figure 4 shows, wage growth increased substantially among both job switchers and all workers. By early 2022, an array of economic indicators suggested that aggregate demand greatly exceeded the reduced productive capacity of the economy, and total PCE inflation was nearing peak levels.[4]

[2] The trend is constructed over the 2015–19 period.

[3] Ferrante, Graves, and Iacoviello (2023) find that the shift in demand toward goods contributed significantly to the surge in overall inflation because of the constraints faced by producers in expanding production.

[4] For example, the vacancy-to-unemployment (V/U) ratio and quits rate both peaked in March 2022, the share of respondents in the Quarterly Survey of Plant Capacity Utilization (QPC) reporting an insufficient supply of materials peaked at 43 percent in the fourth quarter of 2021 (relative to a pre-pandemic level near 10 percent), and the housing rental vacancy rate bottomed out at 5.6 percent in the second quarter of 2022 (relative to a pre-pandemic level near 7 percent).

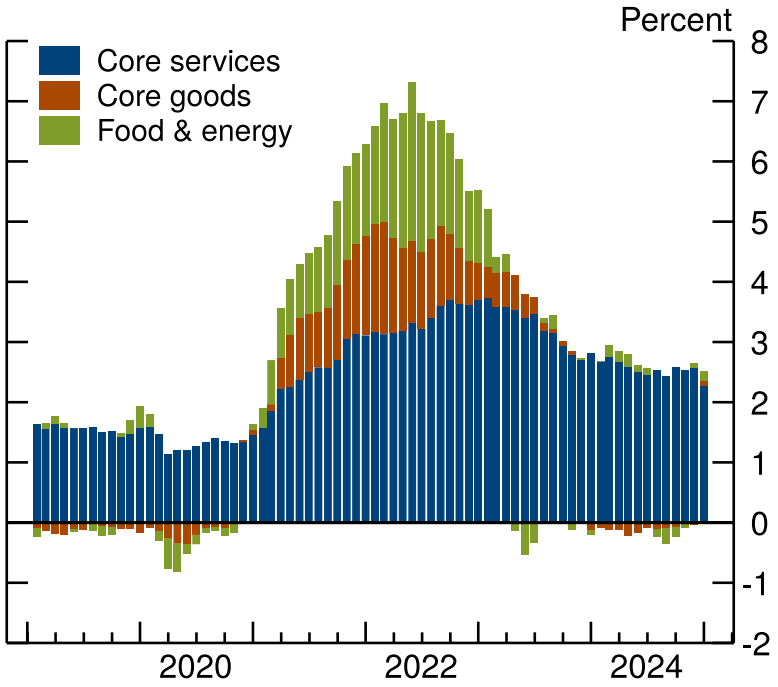
**Figure 2: Real consumer spending, percent deviation relative to pre-pandemic trend**




Notes: Displayed are the percent deviations of real goods PCE, real services PCE, and total real PCE from their respective 2015–19 trends.

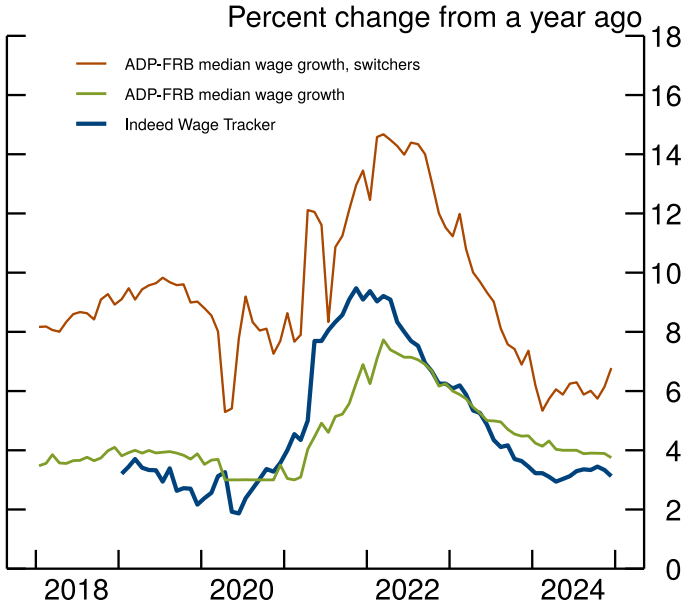
Source: Bureau of Economic Analysis via FRED; authors' calculations.

**Figure 3: Contributions to 12-month headline PCE inflation (year-over-year)**




Source: Bureau of Economic Analysis via FRED; Federal Reserve Bank of San Franscisco staff calculations.

**Figure 4: Measures of wage growth**




Source: Indeed, Inc.; Automatic Data Processing, Inc. Payroll Processing Data; Federal Reserve Board staff calculations.

## 2.2 Large and persistent shifts in supply and demand spurred inflation

Shortages and supply disruptions indicate that reduced supply helped spur inflation in 2021; however, the surge in economic activity, reflected by consumer spending in figure 2, suggests that strong demand was also an important factor. An active line of research attempts to measure the contributions of demand and supply to the inflation surge, and there remains no consensus on the relative importance of each. Some studies report that demand factors were the major driver, while others point to mainly supply factors.[5] Most show that while some mix of supply and demand factors led to heightened inflation, their effects occurred at different times.[6]

[5] Bernanke and Blanchard (2025), for example, find that sectoral and commodity price shocks were especially important contributors in 2021 and 2022. Cuba-Borda and L'Huillier (2025) review the literature and evidence in favor of inflation being primarily a supply phenomenon. In contrast, Giannone and Primiceri (2024) find that high inflation in both the U.S. and the euro area was driven largely by demand forces. Lansing (2025) finds that demand forces were important for inflation during the pandemic era and dominated the influence of supply forces in the U.S.

[6] Di Giovanni, Kalemli-Özcan, Silva, and Yildirim (2023 [rev. 2025]), for instance, find that while supply shocks were important in 2020, demand factors became more relevant in 2021 and 2022. Dupor and Hogan (2025) find that demand conditions began rebounding in 2021 before supply factors began having stronger inflationary effects in 2022

One example of this pattern is the San Francisco Fed's decomposition of 12-month PCE inflation into supply- and demand-driven components shown in figure 5.[7]

This decomposition estimates how supply and demand factors evolved in the years preceding COVID-19 and over the course of the pandemic period. The supply-driven contribution steadily increased following the onset of the pandemic alongside the emergence of severe supply chain disruptions and reductions in labor supply.[8] Specifically, the supply-driven contribution increased 0.7 percentage point through 2020 and an additional 1.3 percentage points through 2021. This steady increase in supply-driven inflation coincided with accelerating input costs across the globe in 2021—namely, commodities such as oil, lumber, plastic, and metals. The overall contribution of supply factors peaked in June 2022, when it reached 3.2 percentage points. This peak was four months after Russia's invasion of Ukraine, which further disrupted global energy and commodity markets.

Demand factors also contributed to the inflation surge, though their dynamics differed from those of supply factors, particularly in the early phase of the pandemic. The demand-driven contribution fell 1.4 percentage points in April 2020, as stay-at-home orders and virus-related risks caused consumers to significantly pull back on spending. Demand-driven inflation then began to reverse course, coinciding with the broader reopening of the economy as well as the implementation of the American Rescue Plan—which boosted government spending and household incomes while monetary policy remained very accommodative.[9] Demand-driven inflation steadily increased thereafter, peaking in September 2022 at 3.1 percentage points—a few months after the peak in supply-driven inflation, but with a similar magnitude. This pattern suggests that strong demand exerted upward pressure on inflation for well over a year following the economy's reopening.

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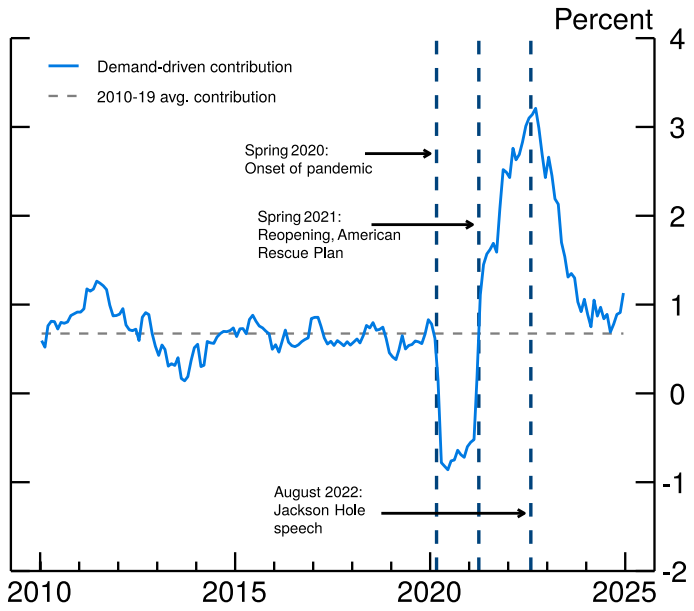
[7] The decomposition, outlined in Shapiro (2025), is based on the price and quantity movements in the categories underlying the PCE price index. Demand-driven categories are identified as those where an unexpected change in price moves in the same direction as the change in quantity in a given month. Supply-driven categories are identified as those where unexpected changes in price and quantity move in opposite directions. One caveat to this type of identification scheme is that it includes the endogenous reactions to aggregate supply and demand shocks. For example, as shown in Shapiro (2025), a negative oil supply shock can cause a positive demand shock for non-oil fuels. The decomposition also includes an "ambiguous" category (not shown), which captures cases where the methodology cannot distinguish between supply and demand factors. For this reason, the supply- and demand-driven contributions in figure 5 do not sum to total PCE inflation.

[8] Labor supply reductions were apparently caused by virus-related health risks, caregiving responsibilities for children unable to attend school, and an increase in early retirements.

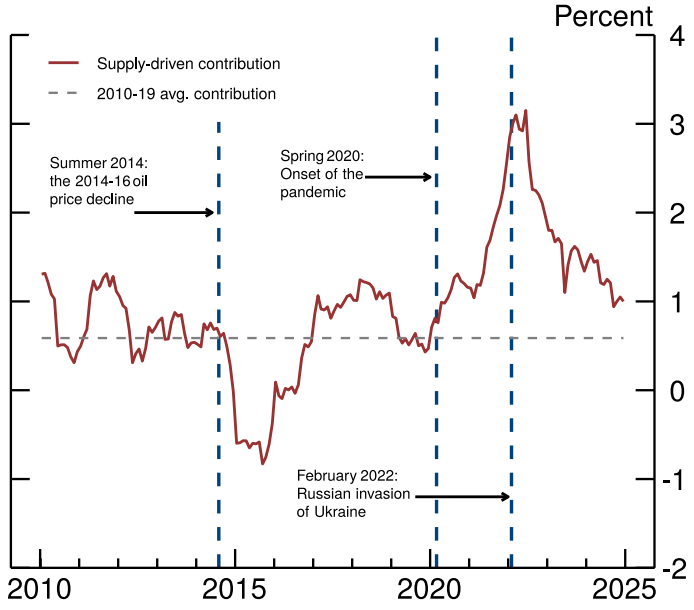
[9] The demand-driven contribution of monthly PCE inflation began surging in March 2021. Recent research continues to debate the contributions of monetary and fiscal policy to the inflation surge, with little apparent consensus. Jorda and Nechio (2023) find that fiscal support contributed 3 percentage points to inflation by the end of 2021, while Barnichon et al. (2021) estimated an effect of only 0.3 percentage point. Bocola et al. (2024) find that the shift to accommodative monetary policy, and specifically the flexible average inflation targeting (FAIT) framework, explains half of the rise in inflation in the post-2020 period. In contrast, Duncan, Martinez Garcia, and Miller (2025) find that FAIT played a much smaller role.

**Figure 5: Supply- and demand-driven PCE inflation**

**Panel A**




**Panel B**




Notes: Panel A displays the demand-driven contribution to 12-month PCE inflation. Panel B displays the supply-driven contribution to 12-month PCE inflation. Not depicted is the ambiguous contribution.

Source: Federal Reserve Bank of San Francisco.

## 2.3 Amplifying forces and the role of nonlinearities

The previous section highlighted that shifts in both supply and demand contributed to the rise in inflation. Partly underlying the inflationary effect of those shifts was the emergence of capacity constraints. Capacity constraints imply that firms' or industries' supply curves can steepen at higher levels of output—referred to as a nonlinearity.[10] As depicted in panel A of figure 6, it becomes costly for industries to increase their output when production levels are near capacity and, as a result, prices are raised to a greater extent in response to a given increase in demand. As shown in panel B, this effect can be exacerbated by declines in the productive capacity of the industry, which increase the likelihood that the industry is operating on the steep portion of the supply curve. Specifically, a negative supply shock—an inward shift of the supply curve from $S_1$ to $S_2$—lowers the point at which the supply curve steepens. A positive demand shock is therefore more likely to cross the steep part of the supply curve for an industry experiencing a negative supply shock. Boehm and Pandalai-Nayar (2022) show that nonlinearities in industry-level supply curves can imply a nonlinearity at the aggregate level. Other studies have shown that more complex interactions of supply and demand shocks across industries, inputs, and countries can have important amplification effects on inflation.[11]

Although identification is challenging, recent studies show evidence of nonlinearities in supply for firms and industries.[12] Furthermore, numerous indicators suggest that capacity constraints occurred throughout 2021 and 2022 across many sectors of the economy. Delivery times for materials spiked, and shortages for critical inputs such as semiconductors arose. The New York Fed's Global Supply Chain Pressure Index (GSCPI), which aggregates a number of supply chain indicators, reached four standard deviations above its average historical value. The QPC showed historically unprecedented constraints on production due to material and labor shortages, as well as logistical problems.[13] Labor shortages were also evidenced by historically

[10] For instance, the estimated demand-driven contribution to inflation seen in figure 5 may look large, in part, because firms were constrained in their ability to meet elevated levels of demand.

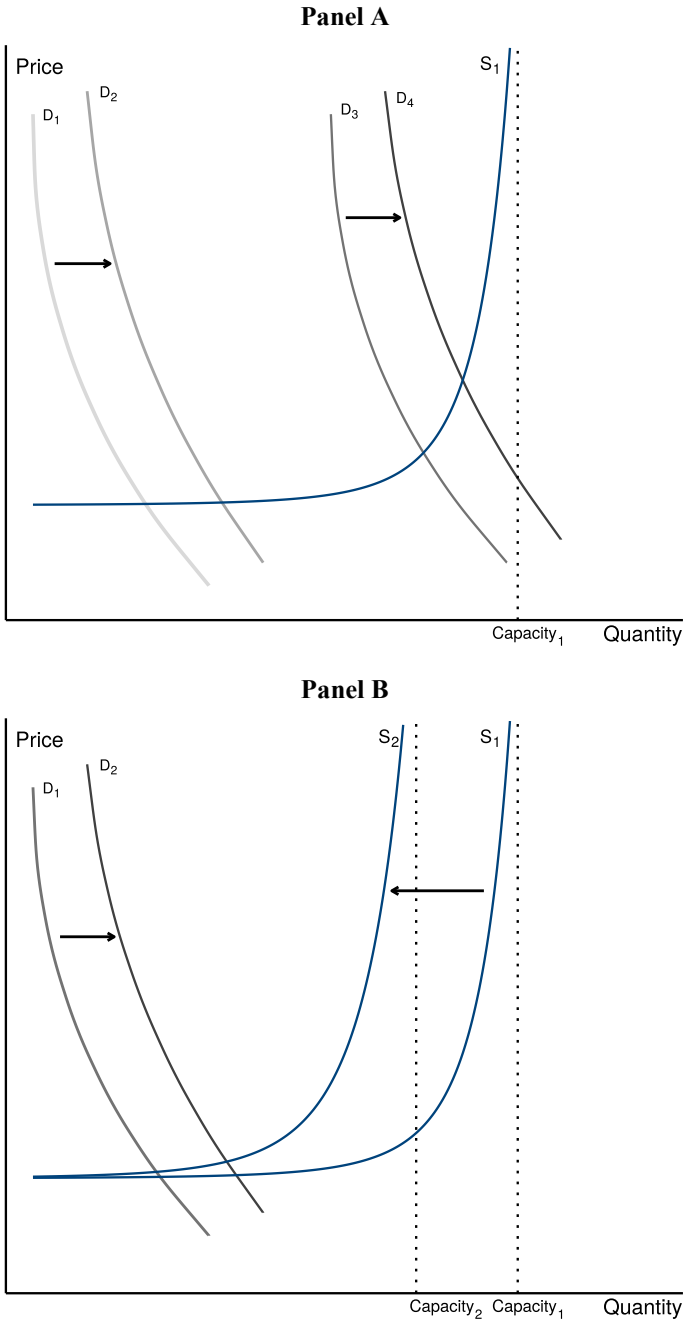
[11] Guerrieri, Lorenzoni, Straub, and Werning (2022) present a model in which a negative supply shock in one sector can reduce demand for products in other sectors. Di Giovanni, Kalemli-Özcan, Silva, and Yildirim (2023 [rev. 2025]) estimate a model in which this effect can occur across countries. Luo and Villar (2023) find evidence that the inflationary effect of sectoral supply shocks was amplified by input-output linkages based on a calibrated multi-sector model. Amiti, Heise, Karahan, and Sahin (2023) show that the simultaneity of supply shocks—a labor disutility shock and input price shock—acted to limit substitution across input types, amplifying the inflationary effect of cross-sectoral shocks.

[12] Boehm and Pandalai-Nayar (2022) find that industries that produce close to capacity have up to five times the price elasticity as those that produce far below capacity. Balleer and Noeller (2024) find that firms that experience shortages of materials raise prices by more than unconstrained firms.

[13] Braun, Flaaen, and Hacioglu Hoke (2024) use QPC data to show that such constraints contributed significantly to inflation in goods.

high levels of the V/U ratio.[14] The consistent pattern across all of these indicators implies that capacity constraints played at least some role in exacerbating the inflation surge.

**Figure 6: The role of nonlinearities in amplifying inflation**




[14] See Foote et al. (2025) for a discussion of the Beveridge curve in the context of assessing maximum employment.

Nonlinearities have also been studied in the context of the Phillips curve, which captures the relationship between aggregate excess demand—that is, the level of economic activity relative to its available capacity—and price inflation. It is common in the literature to use indicators of labor market tightness—either the unemployment gap or the V/U ratio—as measures of aggregate excess demand, although numerous alternatives have been proposed.[15] In this context, a nonlinear Phillips curve implies that a change in labor market tightness has a larger effect on inflation when the labor market is already tight.

The evidence of a nonlinear Phillips curve is mixed. Some studies—for instance, Benigno and Eggertson (2023)—find that tight labor markets can explain much of the inflation surge when allowing for a nonlinearity. Estimates from other studies imply smaller effects or even that nonlinearities are not present at all.[16] A notable identification issue is that it is challenging to distinguish between changes in the slope and shifts in the Phillips curve.[17] The disagreement across studies underscores the challenges of estimating nonlinearities in a Phillips curve setting, making it unclear to what extent labor market tightness accounts for heightened inflation levels.[18] Overall, the timing, breadth, and global nature of inflation since 2021 suggest that imbalances in the economy extended well beyond the labor market and that labor market tightness was not the sole source of the inflation surge.[19]

One piece of evidence pointing to nonlinear effects can be seen in the frequency at which prices change, which increased substantially in the recent high inflation period, as seen in figure 7.[20] Because firms raise prices more quickly when inflation is high, the inflationary effect of

[15] Barnichon and Shapiro (2022) run a horse race between alternative measures of economic slack in forecasting inflation in a Phillips curve framework. They find that labor market indicators, particularly the V/U ratio, provide superior inflation forecasts for prices and wages.

[16] Barnichon and Shapiro (2024) and Smith, Timmerman, and White (2024) find that the slope of the Phillips curve increases in tight labor markets but still remains relatively small. Doser, Nunes, Rao, and Sheremirov (2023) and Beaudry, Hou, and Portier (2025) argue that the nonlinearity disappears when properly controlling for inflation expectations.

[17] For instance, Comin, Johnson, and Jones (2023) argue that constraints act to shift the Phillips curve—similar to a markup shock.

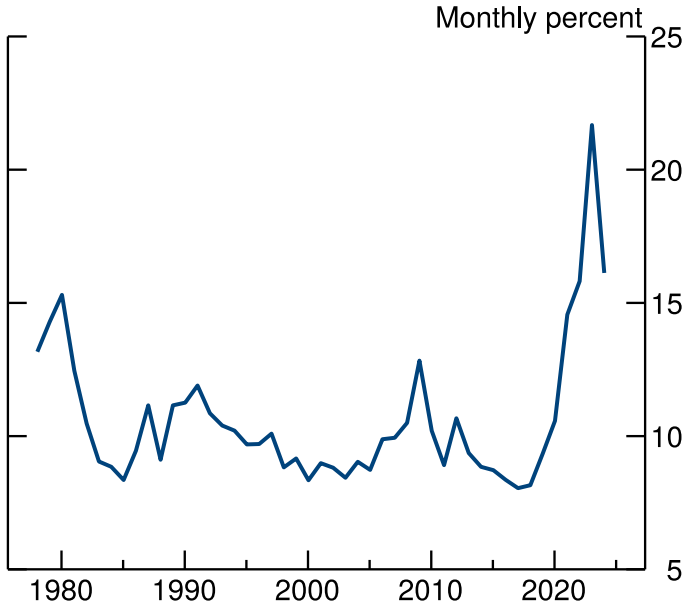
[18] Limited data is an important issue, as there are not many episodes with severely tight labor market conditions. Furthermore, accounting for endogeneity is more difficult in a nonlinear model because alternative instruments are needed. Barnichon and Shapiro (2024) use time fixed effects at the metropolitan statistical area level to help alleviate endogeneity issues and find that the nonlinearity disappears under this specification.

[19] Inflation began rising in the spring of 2021, well before labor markets became unusually tight. Furthermore, the surge was most notable in the goods sector, where inflation did not appear to be related to labor market slack before the pandemic. We also note that wage Phillips curve models based on measures of labor market tightness—and similar to the ones discussed here—do not match the magnitude of the increase in wage growth. This suggests that shocks and imbalances beyond those in the labor market, including possibly households' and firms' near-term inflation expectations, also mattered for wage growth during this period. Finally, see Lipinska, Martinez Garcia, and Schwartzman (2025) for a discussion of the global nature of inflation.

[20] Cavallo, Lippi, and Miyahara (2024) find large increases in the frequency of food and beverage price changes in several countries, while Montag and Villar (2025) find broad-based increases in the frequency in the U.S.

tightness in the economy may be greater and more rapid. In this way, changes in firms' price-setting behavior can contribute to nonlinearities in the Phillips curve.

**Figure 7: Median frequency of price change in the U.S. CPI**




Source: Bureau of Labor Statistics; Montag and Villar (2025).

The role of price setting is illustrated by "state dependent" models in which firms face costs of adjusting their prices—so-called menu costs. In such models, firms adjust prices more frequently and thus will tend to raise prices more quickly when there is a pick-up in cost or general price inflation. State-dependent models therefore imply that the pass-through of cost shocks to inflation is larger and more rapid for large shocks, which can contribute to a nonlinearity in the Phillips curve.[21] In addition, the recent rise in the frequency of price changes in the U.S. was much larger than many menu cost models would predict, and even larger than the rise seen in previous high inflation periods.[22] This finding suggests that firms faced relatively smaller costs or constraints to changing prices than they did before the pandemic. As a result,

[21] Blanco et al. (2024) and Harding, Linde and Trabandt (2024) present price setting models that imply non-linearities in the Phillips curve.

[22] See Montag and Villar (2025). In addition, most of the macro models used to analyze monetary policy in central banks assume that the frequency of price change is fixed, as in a Calvo (1983)-style model. In such models, the frequency of price change is directly related to the slope of the Phillips curve, so a higher frequency implies a steeper Phillips curve. However, the fact that the frequency changes over time is inconsistent with the assumptions of such models.

shocks to inflation may have been transmitted more rapidly and strongly than in the past, leading to an amplified response to supply–demand imbalances.[23]

## 2.4 The post-2022 unwinding of supply and demand imbalances

Since mid-2022, an easing of supply and demand imbalances has helped inflation decline to levels much closer to the Committee's target. Monetary policy tightening and a fading of fiscal support reduced demand, while a healing of supply chains, strong productivity growth, and an increase in the labor force helped expand supply. As shown in figure 2, consumer expenditures across goods and services fully normalized by the end of 2022, which alleviated strains on supply chains.

Figure 5 shows that demand-driven inflation began declining in the fall of 2022, as the Committee rapidly tightened monetary policy and fiscal impetus began fading.[24] By 2022, the level of "excess savings", the additional amount of household savings attributable to the pandemic and associated fiscal support, was significantly lower than in 2021.[25] The healing of supply chains and increases in productive capacity also helped reduce inflationary pressure during this time. Materials shortages diminished, production of certain goods, such as motor vehicles, expanded, and there was a surge in multifamily housing construction. As a result, inflation for goods and market rents fell sharply in 2022 and 2023.

Greater supply was also apparent in the labor market, where a surge in immigration and increases in labor-force participation helped expand the labor force.[26] Overall labor-market rebalancing was evidenced by a decline in the V-U ratio and in the quits rate, and by cooling wage growth. By late 2023, measures of wage growth for job switchers and in job postings, which likely better reflect supply and demand conditions in the labor market than the wage growth of workers remaining at the same job, were at or below their pre-pandemic levels (figure 4).[27]

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[23] The reduction in the costs or constraints around price changes may have been due to firms being more aware of the need to change prices given the magnitude and expected persistence of the changes occurring, or consumers, who may normally dislike seeing prices increase, being more understanding of frequent price changes given the environment.

[24] Najjar and Shapiro (2025) find that core PCE inflation would have been approximately 3 percentage points higher on average between 2022 and 2024 if the FOMC had not raised interest rates in 2022 and 2023. Comin, Johnson, Jones (2023) attribute part of the relaxation in constraints to monetary policy tightening.

[25] See Aladangady et al. (2022), Abdelrahman and Oliveira (2023) and Klitgaard and Higgins (2023). Abdelrahman, Oliveira, and Shapiro (2024) show that the same pattern emerges when measuring household wealth.

[26] Duzhak (2024a) estimates that approximately one-fifth of the easing of labor market tightness in 2023 can be attributed to the increase in immigration. Beyond immigration, there was a large increase in labor force participation among prime-age adults beginning in 2021. Considine et al. (2025) document that much of this increase was due to a rise in labor force participation among women.

[27] See Foote et al. (2025) for a discussion of how wage growth can reflect the balance between demand and supply in the labor market.

Notably, inflation has fallen almost 5 percentage points since mid-2022 to early 2025 without a large increase in the unemployment rate or much softening in GDP growth. Studies have noted that this pattern is consistent with a nonlinear Phillips curve, however, we reiterate that it is difficult to pinpoint the underlying mechanism.[28] For instance, this pattern is also consistent with a shift in the Phillips curve due to a decline in short-term inflation expectations alongside anchored longer-term expectations, which we describe in section 3.

Although inflation has declined substantially, it remains above the Committee's longer-run goal of 2 percent as of early 2025. Persistently elevated inflation is notable in the services sector, especially housing services. While market rent growth returned to pre-pandemic levels in 2022, Consumer Price Index and PCE rent inflation remained stubbornly high for years, reflecting the slow pace at which existing lease contracts catch up to market rates and illustrates how inflation can persist.[29] Disinflation for core non-housing services inflation has also been slow, partly reflecting the lagged adjustment of some prices to large shocks. For instance, insurance premiums and fee schedules for payments to health care providers, which represent about 35 percent of core non-housing services, are typically adjusted once per year and heavily influenced by regulatory factors.[30]

## 3. The behavior and role of inflation expectations

In this section, we describe the behavior of short- and longer-term inflation expectations across various agents in the economy and the role they played in shaping recent inflation dynamics. As described in the previous section, we think that the recent inflation episode was primarily driven by pandemic-induced supply–demand imbalances. However, recent research suggests that the rise in short-term inflation expectations may have contributed to the *persistence* of the inflation surge.[31] Nonetheless, the evidence suggests that longer-term inflation expectations remained generally well anchored, which likely helped contain the inflation surge and contributed to inflation falling without a large increase in unemployment.

[28]Convexities in the Beveridge curve suggest that small movements in unemployment can be associated with a large disinflation, as explained by Crust, Lansing, and Petrosky-Nadeau (2023). Figura and Waller (2022) note that being on the very steep portion of the Beveridge curve, when vacancies far exceed unemployment, can allow for disinflation without a sharp rise in unemployment.

[29] Gallin et al. (2024) and Loewenstein, Meyer, and Verbrugge (2024) document that continuing-tenant rents adjust more slowly to market conditions than new-tenant rents, which could be due to landlords avoiding moving costs or providing discounts to reliable tenants.

[30] The PCE price index includes payments to healthcare providers from Medicare and Medicaid, which are set based on lagged cost indexes and also subject to adjustments set by the Centers for Medicare and Medicaid Services (CMS). Clemens, Gottlieb, and Shapiro (2014) highlight that private payment rates follow Medicare payment rates but adjust sluggishly.

[31] Research by Armantier et al. (2022) found that consumer short-term inflation expectations were as sensitive to inflation news during the inflation surge as during the pre-pandemic period, implying that households' short-term inflation expectations could have exhibited a similar behavior before and after the pandemic.

## 3.1 Short-term inflation expectations of consumers and firms likely contributed to inflation persistence

Beginning in 2021, year-ahead inflation expectations measured across consumers, firms, professional forecasters, and financial markets increased alongside realized inflation, peaking in 2022, as visualized by figure 8.[32] After the inflation peak in 2022, inflation expectations began to decline to finally stabilize at close to pre-pandemic values as of the end of 2024. Our key takeaway is that the large and prolonged rise in households' and firms' short-term inflation expectations – following the inflation surge – likely contributed to inflation persistence through their documented influence on wage and price setting dynamics.

Theory suggests that short-term inflation expectations—regardless of how they are formed—play an important role for households' wage negotiations and firms' pricing decisions. Empirically isolating the effect of short-term inflation expectations on inflation is challenging.[33] However, the literature has recently started to use randomized controlled trial (RCT) experiments to quantify the effects of consumers' and firms' expectations on their economic decisions, providing insights into the role of short-term inflation expectations for inflation dynamics. During the recent inflation surge, an increase in U.S. consumers' inflation expectations was found to increase the probability that they would search for a higher paying job, and to have a small but positive effect on their income growth expectations.[34] Hence, the elevated short-term household inflation expectations could have contributed to higher wage growth, perhaps because workers increased job search to find higher wages or used the threat to do so to bargain for higher wages.[35] Other evidence highlights that a positive shock to firms' short-term inflation expectations can cause firms to raise prices, as firms associate higher future inflation with higher prices for raw materials.[36] Moreover, increases in firms' cost expectations positively correlate

[32] Firms' short-term expectations about their individual costs, as measured by the Atlanta Fed Business Inflation Expectations Survey, behaved similarly.

[33] As shown in Hajdini (2023), short-term inflation expectations tend to highly correlate with past inflation, blurring the direct effects of inflation expectations on inflation.

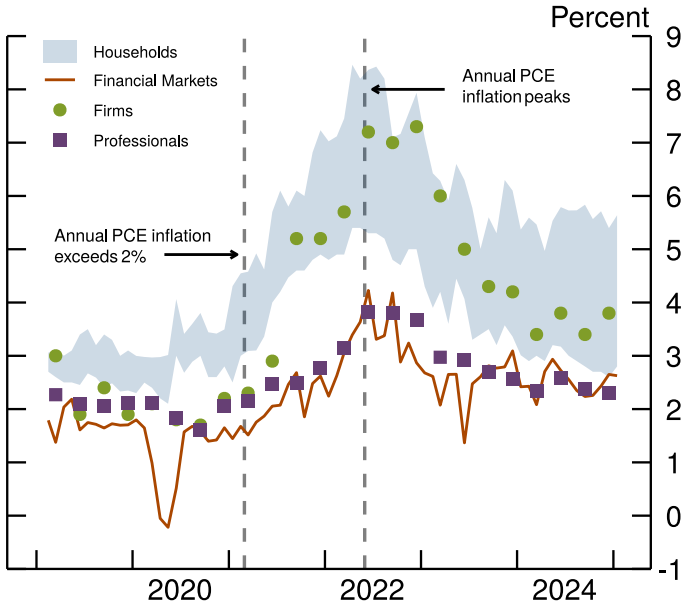
[34] See Hajdini et al. (2022). Pilossoph and Ryngaert (2024) also document that consumers with higher inflation expectations are more likely to search and change jobs.

[35] Corroborating this pattern, Glick and Leduc (2022) find that heightened inflation expectations lead to greater wage growth as workers demanded higher wages. Moreover, as mentioned in section 2, Phillips curve models based only on labor market tightness would have trouble fitting the magnitude of the increase in wage growth seen in recent years. The findings discussed here also help explain the increase in wage growth over this period. Bernanke and Blanchard (2025), for example, find that including short- term inflation expectations in their model helps improve its ability to fit observed wage growth. Importantly, Barlevy et al. (2024) argue that part of the wage growth arising from an increase in on-the-job search results in higher labor costs and hence inflation.

[36] In a study of Italian firms, Coibion, Gorodnichenko, and Ropele (2020) have found that increases in the inflation expectations of firms can cause them to raise prices and lower employment when the ELB is not binding. In another study of Swiss firms, Abberger et al. (2024) find that a rise in firms' short-term inflation expectations causes them to raise prices. Finally, Baumann et al. (2024) find that firms in the euro area plan to increase prices in response to higher inflation expectations.

with their anticipated future price changes.[37] Combined together, the evidence above suggests that the rise in households' and firms' short-term inflation expectations, following the inflation surge, could have contributed to the persistence of inflation, by influencing wage and price setting dynamics.

**Figure 8: Evolution of various measures of one-year-ahead annual inflation expectations**



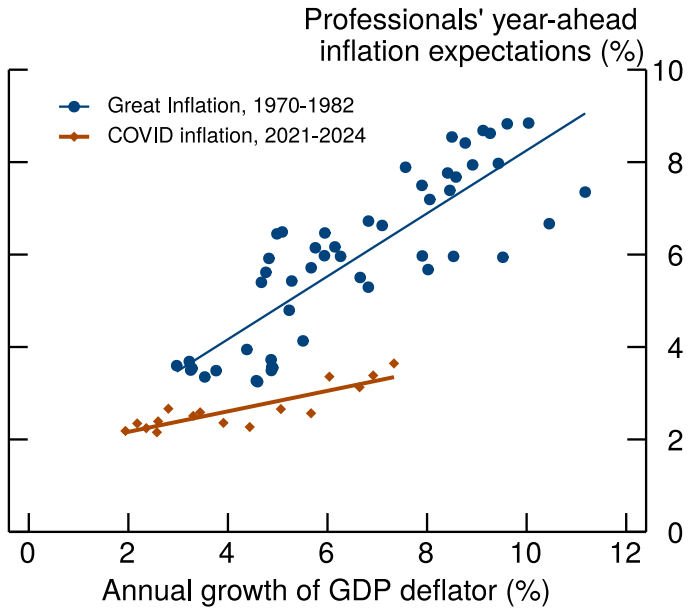

Sources: Bureau of Economic Analysis; Survey of Firms' Inflation Expectations, Federal Reserve Bank of Cleveland; Survey of Consumer Expectations, Federal Reserve Bank of New York; Survey of Professional Forecasters, Federal Reserve Bank of Philadelphia; Indirect Consumer Inflation Expectations, Morning Consult; Survey of Consumers, University of Michigan; authors' calculations.
Note: The range of households' short-term inflation expectations includes several measures of consumers' year-ahead inflation expectations.[38] Professionals' inflation expectations refer to the mean CPI forecasts from the Survey of Professional Forecasters. Financial market expectations refer to the expectations constructed by the Federal Reserve Bank of Cleveland.[39]

[37] See Meyer and Sheng (2025).

[38] These measures include the median for the density and point forecasts from the Federal Reserve Bank of New York Survey of Consumer Expectations, the mean and median forecasts from the University of Michigan Survey of Consumers, and the Indirect Consumer Inflation Expectations. The indirect consumer inflation expectations indicator is constructed from measuring the income growth consumers would need to make up for one-year-ahead expected changes in the price index associated with their current consumption basket. See Hajdini et al. (2024) for more details.

[39] This measure extracts inflation expectations from asset prices using the method of Haubrich, Pennacchi, and Ritchken (2012). Combining a model with various sources of data, such as Treasury yields, inflation data, inflation swaps, and survey-based measures of inflation expectations, the method separates inflation expectations from inflation risk premium and the real risk premium.

**Figure 9: The relationship between professional forecasters' year-ahead inflation expectations and annual inflation, measured by the GDP deflator**




Sources: Bureau of Economic Analysis; Federal Reserve Bank of Philadelphia (mean GDP deflator forecast from the Survey of Professional Forecasters); authors' calculations.
Note: Data is at a quarterly frequency.

The short-term inflation expectations of professional forecasters and financial markets also rose with inflation, but at a much slower pace than expectations of consumers and firms, and moved toward 2 percent relatively quickly after inflation started falling. The relatively muted response of professionals' year-ahead inflation expectations during the recent inflation surge and their subsequent quick return to values around 2 percent contrasts with their heightened sensitivity to changes in inflation during the Great Inflation in the 1970s and early 1980s, as shown in figure 9. The stark difference in the professionals' inflation expectations between the two postwar inflation episodes could reflect professionals' perception that the recent rise in inflation was transitory, or also perhaps the accumulated credibility of the Federal Reserve in keeping inflation stable in recent decades. Regarding this latter possibility, the lower sensitivity of professionals' short-term inflation expectations is consistent with our assessment that longer-term expectations have remained generally well-anchored, which we will discuss in the following subsection.[40]

## 3.2 The stabilizing role of longer-term inflation expectations

The post-pandemic inflation surge presented a significant test to the anchoring of longer-term inflation expectations and marked the largest deviation from the Federal Reserve's 2

[40] Carvalho et al. (2023) show that the behavior of inflation and short-term expectations can be used to infer both longer-term inflation expectations and the degree of anchoring.

percent inflation target since it was adopted in 2012. Our reading of the evidence suggests that the inflation target was effective during the recent inflation surge by promoting stability in longer-term inflation expectations. Despite large increases in shorter-term inflation expectations, longer-term inflation expectations remained generally well-anchored. The stability in longer-term inflation expectations, in turn, likely helped to contain the inflation surge and helped inflation to return toward the 2 percent target without a large increase in unemployment.

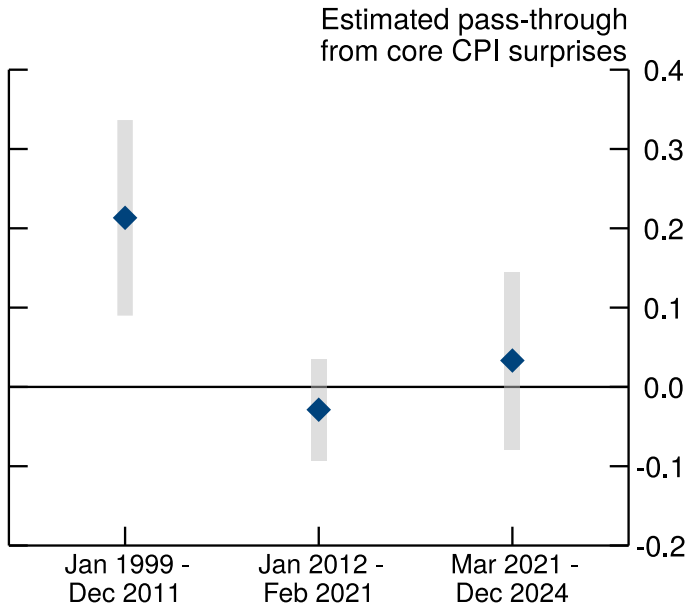
We first review some of the evidence that longer-term inflation expectations remained anchored in recent years before discussing the role anchoring played in containing the inflation surge and facilitating the decline in inflation.

Economists have often focused on the concept of anchoring as laid out by then Chairman Bernanke when he described anchored expectations as a situation in which longer-term inflation expectations are relatively insensitive to incoming data.[41] One line of research has put this concept into practice by measuring the degree of anchoring by the pass-through from surprises in data releases to financial market measures of longer-term inflation compensation.[42] Zero or low pass-through is consistent with well-anchored inflation expectations. Figure 10 shows results from Bundick and Smith (2024), which measures the pass-through from CPI inflation surprises to far-forward, longer-term inflation compensation over three distinct time periods. This analysis provides evidence that the 2012 inflation target helped to better anchor longer-term inflation expectations. Importantly, the improved degree of anchoring was largely maintained during the recent inflation surge.

[41] Bernanke, Ben S. 2007. "Inflation Expectations and Inflation Forecasting." Speech at the Monetary Economics Workshop of the National Bureau of Economic Research Summer Institute, Cambridge, Massachusetts.

[42] For studies focusing on the U.S., see, for example, Gurkaynak, Levin, and Swanson (2010), Beechey, Johannsen, and Levin (2011), and Bundick and Smith (forthcoming).

**Figure 10: Estimates of the sensitivity of longer-term inflation compensation to inflation data over different periods**




Sources: Bundick and Smith (2024); updated to present by authors.

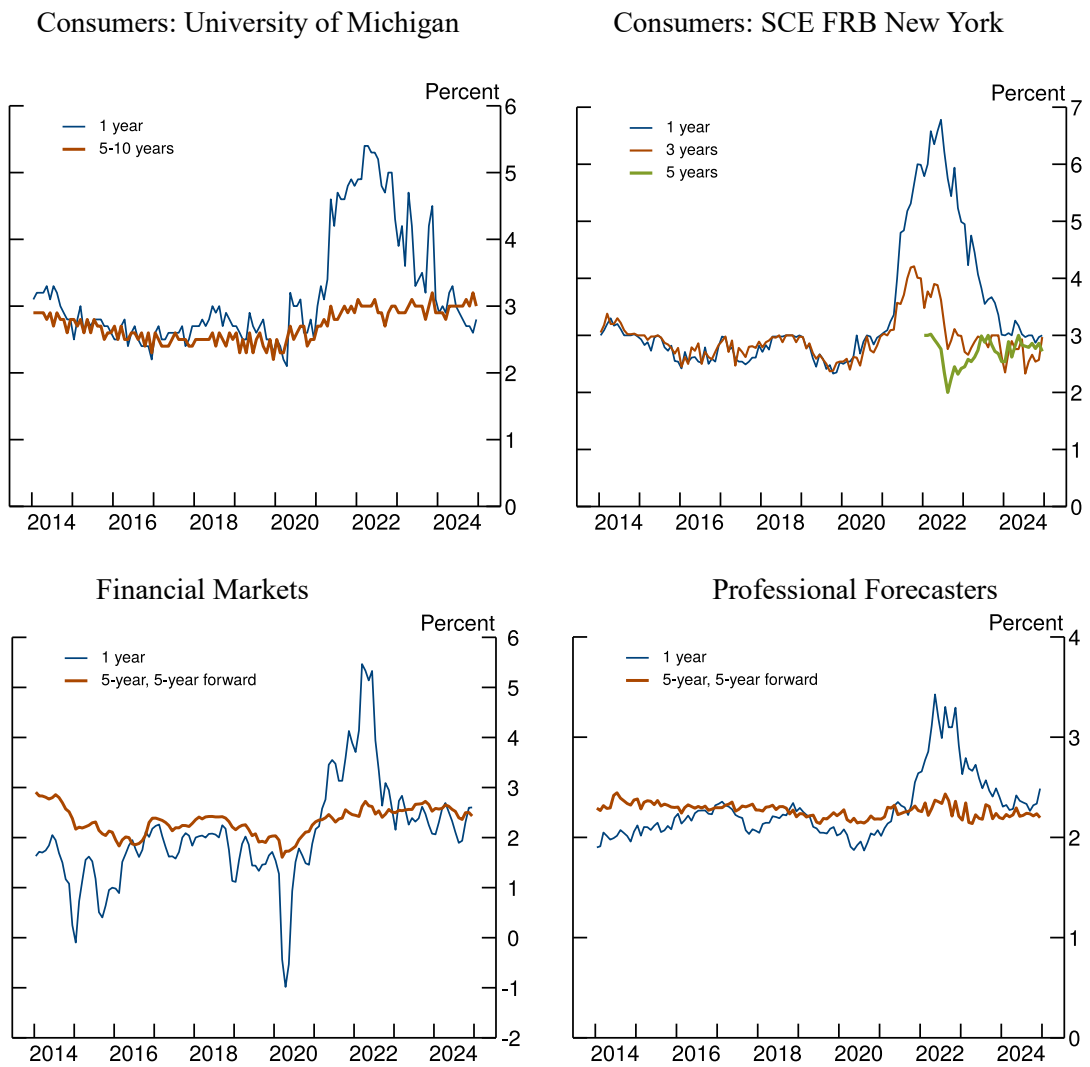
Note: The pass-through is measured from core CPI surprises to 1-year forward inflation compensation maturing in 10 years, derived from TIPS. A core inflation surprise is defined as the reported month-over-month percent change in core CPI less the Bloomberg median forecast ahead of the release. The March 2021 sample break is chosen because that is when 12-month PCE inflation first moved above 2 percent.

More generally, the degree of anchoring can be assessed by comparing the movements in shorter-term and longer-term measures of inflation expectations. Figure 11 shows measures of shorter-term and longer-term inflation expectations across consumers, financial markets, and professional forecasters. For all measures, longer-term inflation expectations increased very little in recent years despite large increases in shorter-term inflation expectations, consistent with generally well anchored inflation expectations.[43, 44]

[43] Lebow and Peneva (2024) use data from the University of Michigan Survey of Consumers to show that household perceptions of *current* inflation increased above their expectations for inflation 12 months ahead, suggesting that households thought inflation would come down over time.

[44] Beginning in early 2025, there was a large increase in the University of Michigan's measures of near-term and longer-term consumer inflation expectations. The increase in longer-term inflation expectations has not yet been corroborated in other survey or financial market measures and comes on the heels of a methodological change in the University of Michigan survey in late 2024.

**Figure 11: Comparisons of shorter-term and longer-term inflation expectations across consumers, financial markets, and professional forecasters**




Sources: Bureau of Economic Analysis via Haver Analytics; Survey of Consumers, University of Michigan; Federal Reserve Board; Survey of Professional Forecasters, Federal Reserve Bank of Philadelphia; authors' calculations.

Across various measures, it appears that longer-term inflation expectations remained generally well anchored in recent years. This favorable outcome was likely supported by aggressive monetary policy actions. Recent research covering this period has shown that as inflation moved further above target and the FOMC began raising interest rates, perceptions of the private sector shifted to anticipate a strong Federal Reserve response to inflation.[45] The large

[45] See Bauer, Pflueger, and Sunderam (2024b), as well as Bundick, Smith, and Van der Meer (2024).

and rapid rate increases in the federal funds rate carried out in 2022 likely informed these perceptions and demonstrated the commitment of the Committee to the 2 percent inflation target.[46] While this evidence is not conclusive, it does seem to suggest that the conduct of monetary policy likely helped to prevent longer-term inflation expectations from becoming unanchored.

The stability of longer-term inflation expectations likely prevented larger and more lasting increases in inflation. Research has found that better-anchored inflation expectations can reduce the volatility and persistence of inflation.[47] Intuitively, if longer-term inflation expectations are unanchored, then otherwise transitory price pressures can be propagated through increases in inflation expectations. It is generally believed that this mechanism contributed to the Great Inflation of the 1970s and early 1980s. For example, some research looking at the 1970's and 80's has argued that the unanchoring of inflation expectations, together with short-lived supply shocks, lifted inflation expectations, allowing high inflation to persist and become embedded in the economy through price- and wage-setting behavior.[48] While the supply and demand shocks outlined in section 2 that led to the pandemic inflation surge were themselves large and persistent, the stability of longer-term inflation expectations likely helped to limit the extent and duration of elevated inflation.

Anchored longer-term inflation expectations may have also helped inflation to return toward 2 percent without a large increase in unemployment. Historically, disinflations have been costly in terms of unemployment because prolonged periods of economic slack were necessary to reduce longer-term inflation expectations. Given this experience, the post-2022 disinflation was unique because inflation declined without a large increase in unemployment. While supply improvements and nonlinearities in the Beveridge and Phillips curves likely played a key role in reducing inflation without necessitating economic slack, the anchoring of longer-term inflation expectations likely contributed to this outcome as well. This recent experience demonstrates the labor market benefits of maintaining well-anchored inflation expectations.

## 4. Lessons from the pandemic and inflation dynamics going forward

In this section, we review some lessons learned from the recent inflation surge and identify several indicators that could be helpful in identifying future inflationary pressures in a

[46] Bauer, Pflueger, and Sunderam (2024a) explicitly link the Committee's policy rate actions to perceptions about the perceived monetary policy rule, and the weights placed on inflation and unemployment. Some models of expectations formation explicitly link the central bank's reaction function (and the responsiveness to inflation) to the degree of anchoring (See, for example, Jorgensen and Lansing, 2021). In such models, an increase in the perceived response of the central bank to deviations of inflation from target would help to anchor inflation expectations. Knoteck, Mitchell, Pedemonte, and Shiroff (2024) provide some supportive evidence for this mechanism from a randomized control trial.

[47] See, for example, Orphanides and Williams (2004).

[48] See, for example, Ball and Mazumder (2011) for some evidence. Ireland (2007) also provides empirical estimates suggesting that short-lived supply shocks during this time were allowed to feed through to longer-term inflation expectations.

timely manner.[49] We also discuss how changes in the economy and our experience with inflation over the past five years could alter the assessment of inflation risks going forward.

## 4.1 Lessons learned from the pandemic inflation experience

The COVID-19 pandemic was an extraordinary event, both in its rarity and the magnitude of the economic shocks it triggered, which warrants against drawing too many conclusions from such a unique period. Nevertheless, we think there are two lessons that can be carried forward.

First, the pandemic period showed how the inflation environment can change abruptly. The extreme events driving the pandemic inflation surge revealed the potential for large shocks to generate severe supply and demand imbalances. The aggregate supply curve can appear flat but steepen quickly when large increases in demand encounter supply constraints, resulting in sharp increases in inflation. In this sense, the pandemic revealed information about inflation dynamics in an economy with severe supply and demand imbalances.

Given our better understanding that inflationary pressures may build suddenly and persist, timely indicators of supply–demand imbalances may be valuable to policymakers. These include vacancies, which vary by more than the unemployment rate when the unemployment rate is low, measures of strain in the market for inputs such as the GSCPI and the QPC, and measures of housing market rents, which are leading indicators of rent measures used in the PCE price index.[50]

Recent inflation dynamics were also amplified by nonlinearities. However, monitoring for nonlinearities in real-time is challenging, making it difficult to determine whether they are affecting the economy. The frequency of price adjustment could be a particularly useful real-time indicator.[51] Thresholds on the unemployment rate or the V-U ratio, such as that suggested in Benigno and Eggertsson (2024), may also be informative but should be used with caution because of limited data and challenges with identification of nonlinearities in a Phillips curve setting.

Second, the recent inflation surge reinforces the importance of keeping longer-term inflation expectations well anchored. Longer-term inflation expectations were thought to be generally well anchored heading into the inflation surge; however, their continued stability through such a severe stress scenario is noteworthy. While monetary policy likely played an important role in maintaining the anchor, our understanding of how inflation expectations are formed and influenced remains limited. Therefore, continued stability in the face of future large

[49] For lessons from the recent inflation surge regarding monetary policy strategies, see Chung et al. (2025).

[50] Foote et al. (2025) discuss various labor market indicators and how they can be used to assess the labor market's position relative to the Committee's full employment goal.

[51] Creating timely measures of the frequency of price change would require cooperation with the Bureau of Labor Statistics, as the necessary microdata are not publicly available.

disturbances is far from assured and measures of inflation expectations deserve continued monitoring.

## 4.2 Why inflation risks might be more balanced than was thought five years ago

At the time of the last framework review, several factors appeared to impart downside risks to the inflation outlook, including the experience with below-target inflation and risks posed by the ELB.[52] In this final section, we discuss why future risks to inflation might now be more balanced.

Inflation outcomes over the past five years revealed the potential for large shocks to the economy to trigger significant inflation surges. While it remains unclear if the underlying distribution of inflationary shocks has changed since 2019, our understanding of the potential risks has evolved. In particular, there is a greater appreciation for the fragility of supply chains and the role of capacity constraints in amplifying inflation. These supply effects are likely stronger and more persistent when they coincide with monetary and fiscal stimulus. Moreover, synchronized disruptions across geographies or shortages of essential inputs can pose a particular upside risk to inflation, given the limited substitutability of affected suppliers.

The behavior of short-term inflation expectations after the pandemic may also impart upside inflation risks. While longer-term inflation expectations remained well anchored, some research suggests that the recent period of high inflation may have contributed to inflation becoming more salient in the minds of the public.[53] Financial markets are more sensitive to inflation news and recent studies suggest that the public might be more attentive to inflation than they were before the pandemic.[54] Shorter-term inflation expectations may be more sensitive to inflationary news, and particularly news of higher prices, after a period of high inflation, although it is uncertain to what extent such changes will persist.[55] The evidence of feedback between actual and expected inflation discussed in section 3 suggests that any sustained changes

[52] See Gourio, Johannsen, and Lopez-Salido (2025).

[53] Studies by Pfauti (2024) and Weber et al. (2025) show that consumers' and firms' attention to inflation rose significantly during the recent inflation surge. Moreover, Gennaioli et al. (2024) show that inflationary shocks can prompt retrieval of past high-inflation experiences, which would then lead to a strong response of inflation expectations to inflationary news. The authors document that this mechanism was quantitatively important to explain the fast surge in short-term inflation expectations across all consumers in the U.S. Moreover, Stantcheva (2024) documents that in two waves of surveys in December 2023 and January 2024, consumers ranked inflation to be the top economic and social issue. Finally, Hilscher, Raviv, and Reis (2024) estimate the perceived probability of a future inflation disaster, that is, of future inflation exceeding 4 percent, to have stabilized after the inflation surge but at higher than pre-pandemic levels.

[54] Kroner (2025) shows that financial markets attention to inflation news remained significantly higher than before the pandemic during the disinflation period. Korenok and Munro (2024) provide suggestive evidence that public's attention to inflation remains high after inflation returns to pre-surge values.

[55] For instance, D'Acunto et al. (2021) show that the short-term inflation expectations of US households are more responsive to positive grocery price changes than negative grocery price changes. Cavallo, Cruces, and Perez-Truglia (2017) found a similar result.

to the behavior of short-term inflation expectations could be important for inflation dynamics going forward.[56]

Finally, reduced effective lower bound (ELB) risk could also be important in determining the risk to inflation going forward. At the time of the previous framework review, heightened ELB risk stemming from the low level of interest rates raised concerns that longer-term inflation expectation could drift lower. By some accounts, the neutral level of the federal funds rate has increased since just before the pandemic.[57] All else equal, a higher neutral rate reduces the likelihood that the funds rate will be constrained by the lower bound in the future, reducing downside risks to inflation and longer-term inflation expectations.[58] While we acknowledge that the ELB may yet remain a concern relative to previous decades when the neutral level of the funds rate was thought to be much higher, on the margin ELB risk appears to have declined somewhat since 2019. Whether the potential reduction in ELB risk is large enough to have a meaningful effect on inflation outcomes depends on the magnitude of the increase in the neutral federal funds rate, which is highly uncertain. For instance, FOMC participants had a wide range of projections for the longer-run federal funds rate in the most recent March 2025 SEP, ranging from 2.5 to 3.9 percent.

Overall, the risks to inflation appear more balanced than was perceived at the time of the last framework review, although the uncertainty of such an assessment is great. These greater upside inflation risks stem from a plausibly higher perceived likelihood of abrupt increases in inflation due to large shocks, disruptions to critical inputs, and nonlinearities; the potentially greater salience of inflation in the wake of the pandemic and its effects on inflation expectations; and the possibility that the neutral rate has moved higher since immediately before the pandemic and therefore the downside risks to inflation and longer-term inflation expectations from the ELB have possibly diminished.

[56] On the other hand, research by Armantier et al. (2022) found that, compared with the pre-pandemic period, consumer short-term inflation expectations did not become more sensitive to inflation news during the inflation surge. There is also evidence from Bundick and Smith (2024) that financial market measures of longer-term inflation compensation from financial markets do not seem to have become more responsive to inflation shocks since the pandemic.

[57] For example, estimates of the longer-run federal funds rate from the Federal Reserve Bank of New York's Survey of Primary Dealers and Survey Market Participants have increased since 2019.

[58] See Mertens and Williams (2021).

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